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UDC 621.793.74.048.7

Influence of Laser Processing on Structure and Friction Properties of Plasma Self-Fluxing Alloy Coatings

18420218a Kiev POROSHKOVAYA METALLURGIYA in Russian No 1, Jan 88 (manuscript received 15 Apr 86) pp 11-14

[Article by N. V. Spiridonov, V. A. Protasevich and T. I. Samodeyeva, Belorussian Polytechnical Institute]

[Abstract] A study is made of the influence of laser processing on formation of the structure of plasma coatings consisting of self-fluxing nickel-based alloys. The alloys were applied to the surface of type 20 steel specimens by plasma metallization, then exposed to a continuous CO_2 laser with a power of 800 W. X-ray structural analysis was performed in monochromatic copper radiation; the macro- and microstructure were studied on a light microscope and by scanning electron microscopy. The microhardness of the melted layer and structural components were determined. Laser melting of the powdered self-fluxing alloy coatings was found to have a positive influence on their structure, increasing hardness. Friction testing showed that the method and conditions of melting significantly influenced the usage characteristics of the coatings. The wear of specimens obtained by gas-flame melting was 5 to 10 times greater than that of laser-melted coatings. Laser treatment also decreases the tendency to seize, scratch and crack. There is practically no running-in period, and in many cases the coefficient of friction decreases. Laser melting of plasma coatings consisting of self-fluxing nickel-based alloys thus improves the structure and friction characteristics of the coatings. References 2: both Russian.

6508

UDC 666.762.1:166.368

Influence of Nitriding of Silicon on Binder Properties in the Silicon Nitride-Phosphate Binder System

18420218f Kiev POROSHKOVAYA METALLURGIYA in Russian No 1, Jan 88 (manuscript received 18 Dec 86) pp 80-85

[Article by Ye. P. Mikhashchuk, D. M. Karpinos, deceased, U. Sh. Shayakhmetov, R. A. Amirov and I. V. Dranka, Institute of Material Science Problems, Ukrainian Academy of Sciences; Bashkir Pedagogical Institute]

[Abstract] A study is presented of the properties and physical-chemical processes occurring ir the silicon nitride-phosphate binder system with varying nitrogen content in the silicon nitride. Specimens were heat treated in air and the strength of the specimens was determined by compression of disk-shaped specimens on the diameter. Composites based on silicon nitride in phosphate binder with varying nitrogen content in the nitride are found to be similar in their physical and mechanical characteristics, a result of the similar nature of the processes occurring during heating and similar composition of new formations. In many cases, less expensive silicon nitride with lower nitrogen content can be used to manufacture products. References 5: 3 Russian, 2 Western.

6508

UDC 621.793.6

Use of Thermoreactive Powders to Harden Steel and Cast Iron Parts

18420218b Kiev POROSHKOVAYA METALLURGIYA in Russian No 1, Jan 88 (manuscript received 5 Jun 86) pp 15-17

[Article by A. A. Zhukov, Ye. P. Shilina and G. A. Chernaya, Vinnitsa Polytechnical Institute]

[Abstract] Inexpensive mixtures are described for surface alloying of steel castings. The mixtures are thermoreactive, but the thermal effect of the interaction of the components is insufficient to maintain combustion without an additional external heat source. When such a source is used, exothermic reactions are maintained, synthesizing stable carbides and liberating iron which bonds the carbides in a compact, strong monolithic layer, increasing the temperature to the point that the layer becomes a two-phase liquid-solid mass, firmly welded to the steel or cast iron piece being coated. The least expensive mixture consists of cast iron powder and ground low-carbon ferrochrome. Results are described from hardening of parts by means of a powder consisting of low-carbon ferrochrome and crushed white cast iron chips. References 4: all Russian.

6508

UDC 621.762:661.65:669.26:621.793:539.56

Mechanical Properties of Chromium Carbide and Coatings Made of Its Alloys

18420218e Kiev POROSHKOVAYA METALLURGIYA in Russian No 1, Jan 88 (manuscript received 8 Feb 85) pp 64-69

[Article by V. N. Klimenko, V. A. Maslyuk, V. G. Kayuk and O. I. Pushkarev, Institute of Materials Science Problems, Ukrainian Academy of Sciences]

[Abstract] A study is presented of the brittleness and strength properties of chromium carbide and coatings made of alloys based on it on the microscopic scale. Specimens were prepared by hot pressing, yielding residual porosity of not over 2-3%. The micromechanical properties were determined by impression of a Vickers diamond pyramid by automatic loading in the range of 0.5-2N. It is found that the crack resistance of the coatings is determined by the content of metal binder, increasing with increasing binder content in the range from 15 to 25%. Nickel phosphide hardening of the binder can be used to increase fracture toughness slightly. The method of microindentation can reliably determine the microbrittleness and microstrength properties of hard chromium-carbide-based alloys. References 10: 9 Russian, 1 Western.

6508

Ways To Increase Gold Production in Amur Oblast

18420172b Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Jun 87 p 2

[Article by A. Zarukin, director, Amurzoloto Production Association, "Will Independent Miners Mine for a Long Time?]

> The article "You Did Not Even Dream about It", published on May 13, 1987, was a source of deep satisfaction to me and to the entire administration of the Amurzoloto Prtoduction Association. In my opinion, a shroud of secrecy, a haze, was removed from the affairs of the entire industry. I believe that the palisade of prohibitions and the absence of publications about the gold-mining industry were beneficial only to those engaged in machinations, those in whose interest it was to conceal the mismanagement of the industry's affairs. Particularly if it regards co-operatives.

Until recently, the problem of increasing the production of gold was most conveniently solved by the USSR Ministry of Nonferrous Metallurgy by increasing the proportion of mining by independent miners. Additional tasks for the co-operatives were set by former minister P. Lomako himself at annual tea receptions he used to give for the chairmen of the co-operatives, circumventing even the directors of the gold fields. Therefore today our enterprises are constrained by so many unnecessary instructions and recommendations that the managers of the associations in the Soyuzzoloto system can be compared to a three-legged horse. For example, why do we have constant directives regarding the contracts with the gold field collectives that practically prohibit compensation of labor on the basis of performance expressed in terms of gross revenues, as the times demand.

Currently, a considerable part of gold at the Amurzoloto Production Association is produced by independent miners. But the situation of the co-operatives' members is quite unenviable. They work 12 hours a day. They get a day off during the entire season only on the first of May and the seventh of November. An ordinary independent miner sleeps in a barracks. He eats what God in the person of the supplier [snabzhenets] sends him. He earns several thousand roubles during the summer and goes for a rest with his family during the winter. In terms of monthly income, all these thousands are not that great.

Most frequently, big money is made only by the co-operative's management. There are various bonuses, multipliers, and supplements, and all of a sudden the earnings of the management of independent mining co-operatives are two or three times as high as those of a taiga bulldozer operator. It happens that a group of people, under the guise of interests of the state, mercilessly exploit ordinary workers with complete unawareness of the public.

Are we combatting this? Formally, we are. All the chairmen are communists. They are thoroughly screened, both at the association and at the gold field to which they are assigned. All employment books are kept at the personnel departments of gold fields or associations But strictly speaking, this is the extent of our control over them. According to regulations, the management of the co-operatives recruits independent miners from all over the country, but in practice the chairman alone selects the applicants for the following season. He knows "his own" people, and he sets the rate for those who make the least fuss. I should add that information spreads among independent miners throughout the country with a speed that the Ministry of Telecommunication does not even dream of. If a co-operative "lucks out" according to its final accounting, all independent miners in the country know about it the very next day, and any prestigious institution of higher learning will envy the competition to join this co-operative.

Can we dispense with the services of the independent co-operatives today? No. And the main reason is not even that they produce a considerable part of the gold. There is a different consideration. As soon as the independent miners become employees of the state, the labor laws become operative. People will demand normal living quarters and will bring their families. And this means that it will be necessary to open day-care centers and kindergartens and to burden the enterprises with all the problems connected with the provision of new settlements for the workers, particularly with the construction of housing. It is much easier to put the burden of all welfare needs on the shoulders of the miners' co-operatives and to write off old machinery, the useless junk buried long ago under the sand of taiga rivers and streams. The co-operatives will accept everything.

The independent miners are convenient for the USSR Ministry of Nonferrous metallurgy because they present no problems. The only demand on them is that they produce. The ministry almost always favors the chairmen of the co-operatives over the management of gold fields and of the association. The industry's headquarters takes care of the co-operatives at the expense of the state enterprises. In order to abondon the pre-deluge forms of organization of labor in the gold-mining industry, the ministry should fundamentally change the entire management policy, have a deeper concern for the needs of its production associations, and see the prospects of development of various gold-bearing regions.

The gold-mining industry for a long time has been a stepchild in the system of the USSR Ministry of Nonferrous Meallurgy. For many years, all resources -- financial, material,and technical -- have been allocated to us as the last in line. The Amurzoloto association is shorted about 100 bulldozers every year. Metal-cutting machine tools are practically not allocated. Only half of the

needed construction materials are supplied. Most motor vehicles, including those used for transporting people, should have been written off a long time ago.

Last year, the Amurzoloto association gave the state an income of several million roubles. It could have been more if... If the industry's problems were solved at the state level. Currently, the rate is set only to the benefit of the independent miners. The Amur oblast could be changed to one of the largest moneymakers in the country. Already for several years we have been trying to push through the creation of a scientific and production complex of state-owned enterprises engaged in gold mining in the Amur region. These enterprises are capable of a several-fold increase of precious-metals production as early as the year 2000.

What is necessary to accomplish this? Acceleration of the development of the mineral raw-materials base, use of modern mining equipment and techniques, and, of course, the use of the latest scientific developments. To this end, it is necessary right now to create in the Amur oblast an experimental scientific and production complex based within the Amurzoloto association and within the Dragstroymontazh construction and assembly trust,which also operates here, in the Amur region. During the initial contracting stages, one could enlist the participation of the exploration geologists of Dalgeologiya as well as the AmurKNII [as transliterated] and the DVIMS [as transliterated] institutes. All activities of the complex could be self-supporting and self-financed.

Incidentally, two years ago the AmurKNII institute helped to develop an integrated program "Zoloto" [gold] for the oblast. The program was examined and approved by the social and economic development council of the oblast committee of the party. Of course, this program has been coordinated with the leadership of the USSR ministry of Nonferrous Metallurgy and of the Soyuzzoloto. At the same time, the sharply increased gold production provided for by the program was included in the 12th Five-year Plan. But this was practically the extent of the involvement of the USSR Ministry of Nonferrous Metallurgy. Furthermore, the most important gold-mining projects previously included in the plan have been removed from the list of those under construction.

Of course, if we want to mine for gold at state enterprises rather than to create new Clondykes, we must enlist the collaboration of many organizations knowledgable in this area. For example, GKNT [State Committee on Science and Technology of the USSR Council of Ministers], while developing proposals regarding such a complex, should first of all make provisions for mining of deposits on the basis of proven reserves. It is necessary to prepare a budget for principal activities and for social and cultural life amounting to 15 million roubles.

Under the conditions of self-support, we should decide independently on the workforce at the gold fields and on the relative numbers of production, engineering and technical, and service workers. We need independence in the distribution of residual income.

All this does not require large capital expenditures. We practically have the capital already, but the investments must be concentrated within the framework of the complex we are planning.

To shorten the time of planning of geological exploration and mining enterprises, it is imperative to establish the Amurzolotoproyekt [Amurzoloto Planning] institute. If anybody hopes to extract income without putting a single rouble into the development of production, we can not be satisfied with such a management policy. For example, currently the USSR Ministry of Heavy Machinery has practically stopped the production of drilling rigs for the exploration of placer deposits. Spare parts for dredgers, excavators, and bulldozers are not being manufactured.

We should not forget that the Amurzoloto enterprises are situated in the area of the Baykal-Amur Highway. This means that a road is available. Currently we are creating three large farms that will supply foodstuffs to the gold miners. Incidentally, such farms already exist at some gold fields, for example in Solovyevsk, and they perform their supply function in an excellent manner. In a word, with minimal expenditures we can shift the entire production of gold onto the shoulders of state enterprises and let the independents merely clean up what remains after we have finished. Thus the independent miners' co-operatives, even if they remain here and there, will be merely sub-departments of the gold fields, and, figuratively speaking, the need for them will remain only where a dredger can not go.

12973
CSO:1842/172

Nonferrous Metallurgy Industry Ordered To Cooperate More With Local Soviets

18420202 Moscow PRAVDA in Russian 24 Dec 87 p 2

[Unsigned article: "In the Presidium of the USSR Supreme Soviet": "Concerning the Efforts of the USSR Ministry of Non-ferrous Metallurgy to Strengthen Cooperation Between Its Enterprises and Organizations and the Soviets of People's Deputies to Increase Production Efficiency and Meet the Social Needs of Workers More Completely."]

[Text] The efforts of the USSR Ministry of Non-ferrous Metallurgy to strengthen cooperation between its enterprises and organizations and the Soviets of People's Deputies to increase production efficiency and more fully meet the needs of the workers were examined at a meeting of the Presidium of the USSR Supreme Soviet.

In the decree that was adopted it was noted that the USSR Ministry of Non-ferrous Metallurgy is working slowly to strengthen cooperation between its enterprises and the Soviets of People's Deputies. In this regard, the requirements of a decree issued by the CPSU Central Committee, the Presidium of the USSR Supreme Soviet, and the USSR Council of Ministers are not being fulfilled. The decree is entitled "Measures to Further Increase the Role and Responsibility to the Soviets of People's Deputies for Accelerating Socio-Economic Development in Light of the Decisions of the 27th CPSU Congress." Neither are the tasks involved in the work to restructure and radically reform the economy and its management being coped with.

The Ministry and many of its enterprises and organizations have not established permanent ties with local Soviets in the work to ensure the integrated economic and social development of territories. Often, implementation of sound proposals concern enterprise development, increasing the output of consumer goods, expanding services, improving working and living conditions, and the environment.

In violation of established procedure, enterprises frequently do not coordinate their draft plans with the local soviets. Only four of the 22 enterprises in this industry located in Sverdlovsk Oblast coordinated plans about the number of workers .

The USSR Ministry of Non-ferrous Metallurgy, despite the requirements of the CPSU Central Committee, the Presidium of the USSR Supreme Soviet, and the USSR Council of Ministers, has not done anything to develop cooperation between its enterprises and those of other industries for the more efficient use of production potential, raw materials and supplies, capital investments, and in the solution of scientific and technical problems.

The industry has not taken the necessary steps to overcome the lag in the development of the social sphere that has been permitted. Here again there is a lack of communication with local authorities.

There is no well-defined program to provide every family with its own apartment or house by the year 2000, although one-third of the industry's employees need better housing. The level of municipal services for existing housing is extremely low. For example, at enterprises in Chita Oblast, no more than 40 percent of the housing has water and sewage systems, and no more than 50 percent central heating. The industry is eliminating only five percent of its old and delapidated housing annually. Recently, more and more people have been living in barracks-type shelters.

Cooperative housing construction is weak. The example of the Ust-Kamenogorsk Lead and Zinc Combine has not been widely followed. This enterprise helps individual builders with site preparation, the utilities, construction machinery, transport, and building materials.

The industry's plans do not call for fully meeting workers' needs for day-care facilities during the current five-year plan. Moreover, in 1987-88, 10-12 percent fewer day-care centers will be opened. Existing kindergartens and preschools are overcrowded. The incidence of illness at children's facilities throughout the industry exceeds the national average.

The construction of medical facilities, recreational centers, and vocational-technical schools is going slowly. Resources earmarked for these purposes are, as a rule, not utilized. After eleven months, only 30 percent of the 1987 annual plan for commissioning hospitals, clubs, and cultural facilities has been fulfilled.

There is not enough cooperation between the ministry's enterprises and local authorities in the matter of developing factory farms. This holds up providing the farms with feed, seed, and young livestock and the allocating of agricultural lands. Low crop and livestock yields make most of the farms unprofitable. About a fourth of the enterprises do not have farms at all.

The advanced experience of factory farms that have become major sources of supplementary food supply and improved nutrition for workers at the enterprises has not been widely adopted throughout the industry. Last year, the farm of the Bashkir Copper and Sulfur Combine produced 65 kilograms of meat per worker, while the industry average was only 13.5 kilograms. For milk, the figures were 296 and 39, respectively.

The heads of many enterprises give lip service to augmenting the production, increasing the variety, and improving the quality of consumer goods. Their output is below the five-year plan targets. Throughout the industry, only 15 kopeks' worth of consumer goods are produced per ruble of wages. Specialized shops for producing consumer goods are being created extremely slowly. They can be found at only one of every five enterprises, although the industry has tremendous possibilities in this area. In 1986, more than one-fourth of the capital investments allocated for the augmentation of production capacity for consumer goods were not used. The situation this year is not any better.

The volume of paid services provided by industry enterprises remains low. Only about 10 percent of the total consists of services having to do with the repair of housing and durable goods, the preparation of garden plots, car maintenance, goods delivery, and other types of consumer services. The direct provision of sophisticated services at the enterprises is not materializing. In 1987, the plan for the provision of services was not fulfilled.

The ministry has come under sharp criticism before in the standing committees of the USSR Supreme Soviet for serious shortcomings in its work to protect the environment. In spite of this, the situation is improving slowly. State plans for the construction of environmental protection facilities have been systematically disrupted. The creation and introduction of no-waste technologies is being poorly done.

Within the ministry and at its enterprises, work to fulfill instructions of the electorate is not being properly organized. Measures for their implementation have not become an integral part of the production plans of labor collectives. Implementation of instructions is slow and the local soviet authorities are not closely supervising this work.

A cause of serious concern is that many Soviets of People's Deputies, along with their executive and control bodies, are slow to restructure and to adopt economical work methods, are weak in their efforts to develop democratic principles and glasnost in their work, and are not achieving the necessary efficiency and teamwork in their joint work with enterprises and organizations to coordinate production and social development and to meet the needs and concerns of the people. In dealing with these problems, the Soviets of People's Deputies are far from taking advantage of their extensive rights and powers.

Guided by the decisions of the 27th Party Congress, the June 1987 Plenary Session of the CPSU Central Committee, and the seventh session of the USSR Supreme Soviet (eleventh convocation), has charged the USSR Ministry of Non-ferrous Metallurgy to do the following:

Radically improve cooperation with the Soviets of People's Deputies in the development of industry enterprises, the solution of intra-industry problems, and improvement in the way in which the material and cultural needs of the people are met;

Do everything possible to develop and encourage workers' collectives to take an active part in the work being done by the Soviets to accelerate the socio-economic and integrated development of the territories;

Increase the authority and responsibility of enterprise and organization managers for: the implementation of proposals put forth by local soviet authorities concerning higher production efficiency, using this as a basis for increasing their input into the development of these regions; for the timely coordination according to established procedures of plans concerning the appropriate indicators; and for accounting for the instructions of the electorate in these plans.

The Presidium of the USSR Supreme Soviet has instructed the USSR Ministry of Non-ferrous Metallurgy, in concert with its enterprises and organizations, to: take the steps necessary to develop the social sphere; to pay special attention to the northern and far eastern regions; to complete, as quickly as possible, the development of programs to solve the industry's housing problem by the year 2000; within this five-year plan, to completely meet the need for day-care facilities and increase the rate at which medical, educational, and cultural facilities are built; and to plan on significantly increasing the proportion of cultural facilities built using its own resources.

Concrete measures must be developed and implemented in order to attract and keep young people in the industry and to meet their social and cultural needs, particularly for housing.

In the next few years, lags in the production of consumer goods and provision of services must be eliminated, and plans for their augmentation must be faithfully fulfilled.

The necessity of being extremely responsible for solutions to environmental protection problems has been pointed out to the USSR Ministry of Non-ferrous Metallurgy. Laws passed to protect the environment must be strictly complied with, plans for commissioning facilities to protect the environment must be carried out, and industry science must do more to introduce and adopt ecologically clean technologies. Specific timetables must be determined for construction, and waste-treatment plants for the enterprises must be created.

The utilization of non-ferrous metallurgy by-products to increase the output of building materials and other products must be decisively improved. Steps must be taken to organize intra-branch production associations for this purpose. Assistance must be rendered in every possible way to establish and develop cooperatives for reprocessing secondary raw materials at industry enterprises.

USSR ministries and departments and the Council of Ministers of the union and autonomous republics have been assigned the task of using economic methods of management as a basis for implementing measures to engage the enterprises in cooperative efforts with the Soviets of People's Deputies to carry out the tasks of comprehensively developing the production and social spheres.

Guided by the requirements of the USSR Law "Concerning the State Enterprise (Association)", the Soviets of People's Deputies and their executive and control bodies have been asked to critically appraise how things stand with the development of their cooperation with enterprises and organizations in the integrated economic and social development of the territories and to constantly work to strengthen their role in this important matter.

On the basis of a rational balance between territorial and industrial interests, the efficiency of all enterprises and organizations must be enhanced. This can be used to strengthen the revenue base of local budgets.

Special attention must be given to the fact that, as enterprises make the transition to full economic accountability and financial self-sufficiency, and as main production-economic administrations are established by the executive committees of kray and oblast Soviets of People's Deputies, there must be more energetic leadership and coordination of the activity of all enterprises and organizations regardless of their departmental affiliation.

The work of the main production-economic administrations must be founded upon a strict regard for the mutual economic interests of the local Soviets of People's Deputies and the enterprises and organizations in the solving of production problems and in the social development of the regions. The principles of democratic centralism must be observed, extensive glasnost supported, and public opinion taken into account.

The USSR Ministry of Non-ferrous Metallurgy must submit a report concerning its compliance with this decree to the Presidium of the USSR Supreme Soviet by February 1, 1989.

/12223

CONSTRUCTION DELAYS PREVENT PERICLASE PLANT STARTUP

18420152 Moscow EKONOMICHESKAYA GAZETA in Russian No 23, Jun 87 p 19

[Article by V. Shloma, staff correspondent, datelined Razdolinsk Posyolok, Krasnoyarsk, under the rubric "Investment Complex: Experience, Problems, Solutions": "'Dolgostroy' [Protracted Construction] the Taiga"; first paragraph printed italic]

[Text] "Artifical periclase, usually produced by dead burning at 1,600-1,650 degrees or electric melting of natural magnesite, plays an important role in production of magnesite refractories," says the Great Soviet Encyclopedia.

And indeed, periclase was until recently regarded primarily as an outstanding refractory. Metallurgists know very well that the higher the quality of the natural mineral processed in this manner, the better the quality of steel or nonferrous metals one can obtain.

But since that volume of the encyclopedia was published, the applications of periclase have noticeably expanded. Without exaggeration, one may say that scientific-technical progress, in the electrical equipment industry for example, is unthinkable without it. Without periclase it is impossible to manufacture fire-resistant electrical cables or thermoelectric heaters which can operate in gas, liquid, or solid media. It is now almost impossible for atomic power engineering to perform efficiently and reliably without cable products, whose principal base is periclase.

For a long time, periclase, like other refractories, was produced by ferrous metallurgy plants. This circumstance is important in the story being told here.

In 1964 the antimony reserves of the Northern Angara deposit in Krasnoyarsk Angara Region were exhausted. By this time, this nonferrous metallurgy enterprise had a developed industrial base and, most important, a worker settlement of 12,000 inhabitants, strong by Siberian standards. At that time geologists were exploring for reserves of many minerals, including deposits of high-quality magnesites, in the Lower Angara region. The managers of the "Yeniseyzoloto" Association got the

idea to re-allocate the works' newly idle capacities to production of periclase from magnesite. The USSR Ministry of Nonferrous Metallurgy approved and supported this sensible proposal.
The enterprise did all the necessary calculations on its own. A new production facility was even designed on site, and in 1964 the first periclase was produced.

The demand for the new raw material grew rapidly. Suffice it to say that today the Severo-Angarsk Periclase Plant delivers its product to dozens of addresses. The sharp rise in demand dictated the need to expand the new plant's capacities. They were expanded, with maximum use of the same old buildings of the former antimony plant.

Thus the "Yeniseyzoloto" Association gave birth to an enterprise whose products couldn't possibly have anything to do with nonferrous metallurgy.

By 1975 it had become clear that the periclase plant on the Angara could handle neither the increasing demand nor the increasing requirements for product quality. The technology was and still is on the level, shall we say, of our grandfathers' time.

The USSR Ministry of the Electrical Equipment Industry and USSR Gossnab were worried, since they had to turn to foreign companies for high-quality periclase. In 1975 the Ministry of Nonferrous Metallurgy decided to build a new enterprise on the territory of the Severo-Angarsk Periclase Plant. This is where the story of the "dolgostroy" in the taiga begins.

Improving the periclase's quality required solid scientific support. But neither Ministry of Ferrous Metallurgy, Ministry of Nonferrous Metallurgy, nor Ministry of the Electrical Equipment Industry institutes were researching this material. So plant personnel didn't sit with their hands folded. They created their own research laboratory and invited scientists from Tomsk State University to collaborate. However, three years later it became obvious that its forces were clearly inadequate to solve this complicated problem. The problem of periclase quality was assigned to solid scientific institutions: the Ministry of the Chemical Industry's VNIIyodobrom [All-Union Scientific Research Institute for Iodine and Bromine, the Ministry of Ferrous Metallurgy's Eastern Refractory Institute, and the Ministry of Nonferrous Metallurgy's SibtsvetmetNIIproyekt [Siberian Division of the Scientific Research Institute for Design of Nonferrous Metallurgy Enterprises].

However, as often happens when seven nursemaids are assigned to look after a child at the same time, each organization reported successful fulfillment of its own part of the research, and the overall problem remained unsolved.

Therefore, two years ago the USSR State Committee for Science and Technology assigned the function of lead organization in developing a technology for producing high-quality periclase to the USSR Ministry of

Ferrous Metallurgy's Eastern Refractories Institute. So now there is a lead organization, but there are still no genuine results. The institute has neither a laboratory specializing in such an urgent problem nor a clearly defined program of research. The problem of periclase quality remains, as before, open.

And how is the construction doing in the mean time? The general subcontractor, Glavkrasnoyarskstroy, began it. To put it mildly, the glavk was in no hurry. In four years, only a little more than 14 million rubles were assimilated at the construction site, while the budgeted cost of the project was 55 million. All work was to have been done in 1980, but that turned out to be far off the mark. Then a new deadline was set -- to start up the capacities to produce electrical periclase in 1985. However, during the five-year plan workers of the Ministry of Nonferrous Metallurgy and Glavkrasnoyarskstroy cheerfully did everything to miss the new deadline for starting up the project as well. The Ministry gradually cut off financing, and from one year to the next the builders didn't assimilate even these miserly resources. Construction gradually ground to a halt.

At the same time, other nonferrous metallurgy associations in Krasnoyarsk Kray were annually assimilating hundreds of millions of rubles of capital investment. But these were giants producing large quantities of copper, nickel, and aluminum -- the Ministry of Nonferrous Metallurgy's "native" products. Apparently this ministry never developed kindred feelings for periclase. There was, therefore, no particular activity going on at the territory of the Severo-Angarsk Plant, although responsible ministry workers had been there repeatedly. Each time they came, they adopted various sorts of protoccols and decisions, but construction went on as it had before -- barely, although only 15 million rubles of work remained to complete the plant's startup complex.

"Yeniseyzoloto" Association workers occasionally take the initiative and make the rounds of the departments as petitioners. The files are bulging with papers, and a most valuable material is being produced as it was many years ago -- in a small quantity, of poor quality, and primitively -- in the old shops of the former antimony works.

"Dolgostroy" in the Siberian taiga continues.

12809

UDC 548.3:539.26

The Real Structure of Dynamic-Synthesis Diamonds

18420218d Kiev POROSHKOVAYA METALLURGIYA in Russian No 1, Jan 88 (manuscript received 28 Aug 86) pp 34-40

[Article by A. V. Kurdyumov, N. F. Ostrovskaya and A. N. Pilyankevich, Institute of Materials Science Problems, Ukrainian Academy of Sciences]

[Abstract] A comparative study is presented of the structure of compact modifications of carbon produced under various dynamic synthesis conditions. Possible mechanisms of their formation are analyzed. Transmission electron microscopy and x-ray studies are used to investigate diamond powders produced by high temperature dynamic synthesis and impact compression of crystalline graphite under various loading conditions. Impact compression of graphite causes martensite transformation from graphite to lonsdaleite to diamond, with relaxation of the diamond structural ordering and recrystallization of the diamond. Modification of the conditions of dynamic synthesis can be used to regulate the degree of manifestation of various formation mechanisms, phase composition and fine crystalline structure over a broad range. References 11: 10 Russian, 1 Western.

6508

UDC 621.762:666.3.022.6

Influence of Properties of Microlite TsM-332 Powder on Parameters of Thermoplastic Slip and Ceramic Products

18420218g Kiev POROSHKOVAYA METALLURGIYA in Russian No 1, Jan 88 (manuscript received 27 May 86) pp 92-97

[Article by V. M. Minin, Solid State and Semiconductor Physics Institute, Belorussian Academy of Sciences]

[Abstract] Results are presented from a study of the influence of initial TsM-332 powder on the parameters of a thermoplastic slip and ceramic bodies used as supporting blocks in magnetic heads. The influence of the dispersion composition of the powder on parameters of the thermoplastic slip was also studied. The variation in consumption of plasticizer as a function of specific powder surface was studied at constant viscosity. The particle-size distribution and specific surface of 12 commercial lots of powder are experimentally determined, indicating excessive variation among lots, which prevents production of products with the required properties. Since the production processes are automated and adjustment of slip parameters requires that production lines be stopped, the specific surface of the powder must be restricted by selection before production begins. References 4: all Russian.

6508

UDC 621.315.61

Problems and Prospects for Development of Boron Nitride Ceramics

18420218c Kiev POROSHKOVAYA METALLURGIYA in Russian No 1, Jan 88 (manuscript received 26 Nov 86) pp 23-31

[Article by L. N. Rusanova, A. G. Romashin, G. I. Kulikova and O. P. Golubeva, Obninsk]

[Abstract] A review of previous studies indicates that many attempts to produce ceramics from graphite-like boron nitride powders by hot pressing or sintering of cold pressed pieces have been unsuccessful. The sintering effect is achieved only by the addition of a large quantity of sintering additives, and the materials produced generally do not have the combination of properties characteristic of high temperature materials. Studies performed by the authors have indicated that strengthening of boron-nitride-based ceramics can be most effectively performed by the use of organosilicon compounds. Chemical inertness of the matrix is important in hardening of ceramics by saturation with organosilicon compounds with subsequent pyrolysis. The new technology here suggested utilizes organosilicon compounds to produce high purity boron-nitride ceramics of superior properties by thermal molecular cross-linking. The method can be used to produce ceramics of a variety of refractory materials at relatively low energy cost, using powders of any size, with no limitations in principle as to dimensions of products, in standard furnace equipment by a relatively simple and economical technology. The new ceramic of graphite-like BN can be widely used in high temperature technology, particularly as a refractory material for furnaces. The high thermal stability and chemical inertness allows the material to be used as crucibles and protective covers for thermocouples. The natural softness of graphite-like boron nitride allows it to be used as easily worked sealing rings and bearings. References 9: 5 Russian, 4 Western.

6508

Ultra-Hard Materials Exhibition "ALMAZ-87" [Diamond-87] in Kiyev

18420002a Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Jul 87 p 2

[Article from TASS, "ALMAZ-87 Presents"]

[Text] Firms and foreign-trade associations from Austria, Poland, Finland, Federal Republic of Germany, Czechoslovakia, and Japan are participating in the international trade exhibition "Ultra-hard Materials and Tools" -- "ALMAZ-87", which opened today in the Ukrainian capital. It was organized by the chambers of commerce and industry of the USSR and Ukrainian SSR in conjunction with the Ukrainian Academy of Sciences.

The exhibition includes composite materials based on diamonds and cubic boron nitride, presses, control and measurement instrumentation, articles made from ultra-hard materials, and other products.

Lately, industrial production of synthetic diamonds has greatly influenced the advances in science and technology. The exhibition contributes to the growth of international collaboration in this area. An international conference is being held during the exhibition, during which Soviet and foreign specialists exchange information regarding the latest achievements in this area.

UDC 621.785.5:621.762

Study of Possibility of Combining Processes of Sintering and Carburizing of Powder Alloys

18420204d Moscow METALLOVEDENIYE I TERMICHESKAYA OBRABOTKA METALLOV in Russian No 1, Jan 88 pp 47-50

[Article by V. T. Vysotskiy and F. G. Lovshenko, Mogilev Machine-Building Institute]

[Abstract] A study was made of the influence of combining the processes of sintering and carburizing on the properties of powdered iron and iron-based alloys containing chromium, molybdenum and nickel, introduced by the addition of chrome steel, molybdenum disulfide and electrolytic nickel powder to the iron powder charge. The properties of the powder specimens and alloys were tested following sintering and carburizing at 900-1050 C for 3-9 hours. Combining the processes of sintering and carburizing was found to improve mechanical properties including tensile strength by 10 to 60%. The combined processing system can expand the area of application of powder products and allow their manufacture at plants which have carburizing equipmert. A technological process has been developed at Khimvolokno Production Association in Mogilev for the manufacture of machine parts by powder metallurgy methods in the following stages: charge preparation, pressing of blanks, carburizing, machining, heat treatment, oil saturation. The economic effect of the new technology at the plant is over 96,000 rubles per year. References 7: 6 Russian, 1 Western.

6508

AUTOMATED FURNACE-TO-PRESSURE-CASTING UNIT

18420002b Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Aug 87 p 1

[Article by special correspondent V. Ukolov, "Complex Produces Economy"]

[Text] *Fundamentally new technology developed by a Perm scientist has been placed in production.*

I am holding on my palm a complex turbo-drill part. It is hard to believe that it was not made on a high-precision machine tool -- that it is a steel casting. After a little cleaning it can be sent to the assembly shop. I looked at my watch: the production cycle lasted 60 seconds.

In an article "This is How Steel is Cast" (Sotsialisticheskaya Industriya, 4 July 1984) we reported on the creative research of Perm University scientist P. Bykov. He conducted his experiments at the mining machinery plant. Today his work is completed; he developed a fundamentally new process (LMKI) for casting of metals with charging and casting under pressure. At the same time a pressure-casting unit was built for carrying out the process.

-- The process has no analogs abroad, -- says Pyotr Andreyevich. -- The design and the process are protected by 55 authorship certificates.

-- It is merely necessary to charge steel or nonferrous-metal scrap into the unit. The remaining operations are carried out automatically, -- continues the inventor. -- Molten metal is vacuum-degassed and is charged into a pressure-casting mold. Here the metal solidifies under high pressure, and a finished part comes out after a minute.

-- But doesn't the part have to be machined anyway?

-- Pressure castings are produced with minimal machining allowances, and in many cases without allowances. Not more than 0.5 percent of the metal goes for shavings in machining. As regards quality, our castings do not have shrinkage cavities, porosity, cracks, or slag inclusions. Their ductility is not below that of forged parts, and their strength is considerably higher. The cost of a ton of pressure castings is comparable to the cost of a ton of rolled products. The annual economic effect resulting from the placement of one unit in production is about a million rubles.

UDC 542.65:669.15-194.55

Influence of SuperFast Crystallization on Structure and Properties of Martensite-Aging Steels

18420204a Moscow METALLOVEDENIYE I TERMICHESKAYA OBRABOTKA METALLOV in Russian No 1, Jan 88 pp 32-39

[Article by T A. Chernysheva, T. V. Lyulkina, V. I. Kalita, A. N. Kobylkin and O. K. Revyakina]

[Abstract] Results are presented from a study of the structure and properties of commercial 01N17K12M5T maraging steel obtained by superfast melt crystallization. The steel was made from pure charge materials in a vacuum-arc furnace under excess argon pressure. Rapid quenching was achieved by: 1) Dispersing the melt in a high-temperature gas stream with cooling on a rapidly spinning disk; 2) crystallization of melt droplets produced by electron-beam heating between copper plates; 3) spinning of the melt in an atmosphere of helium. The morphology and microstructure of the rapidly cooled particles were studied by light, scanning and transmission electron microscopy. The phase transition temperatures were determined by differential thermal analysis. Of the three quenching methods tested, the thinnest flakes were produced by cooling on a rapidly spinning copper drum (Method 1), which produced cooling rates of 10^6-10^7 K/s and yielded high dispersed two-phase martensite plus austenite structure and high hardness. The foils produced by Method 2 were thicker and crystallized at lower cooling speeds, forming a single-phase martensite structure, although the martensite conversion temperature was reduced for both Methods 1 and 2. Method 3 produced strips thinner than the foils produced by Method 2, at cooling rates of $6.5.10^6$ K/s, yielding bcc structure of surprisingly low hardness, probably a ferrite phase. Superfast cooling thus greatly influences the phase conversions, structure and properties of maraging steels, varying from fully martensite through mixed martensite and austenite to fully ferrite structures. Maximum hardness is achieved by production of a highly dispersed fully martensite structure with narrow martensite plates. References 18: 2 Russian, 16 Western (2 in Russian translation).

6508

BUREAUCRACY HINDERS THE PRODUCTION OF FERROSILICOVANADIUM

18420127 Moscow EKONOMICHESKAYA GAZETA in Russian No 23, Jun 87 p 17

[Article by Yu. Kanayev, head, Technical Division, Kuznetsk Ferroalloy Plant, "While Science Labors..."]

[Text] Among other products, our plant recently began to produce ferrosilicovanadium, a complex ferroalloy. The ferroalloy is very popular among the machinebuilders. It increases the impact toughness of cast steel, improves the reliability of machines built for frigid conditions, and lowers the weight of various assemblies by almost 20 percent.

In my opinion the specialists of the enterprise have a right to be proud; ferrosilicovanadium was produced for the first time in the world by a fundamentally new practice that ensures a more complete (up to 90 percent) extraction of the components as well as a several times greater productivity than that obtained by the previously used practice. The industrial use of the innovation is being mastered by the specialists and workers of the plant together with the scientists of the Ural Research Center of the USSR Academy of Sciences and of the Ural Scientific Research Institute for Ferrous Metallurgy.

We prepared specifications for our ferroalloy, but owing to the absence of standartization service at the plant we made some errors in formatting of the documents. Specifically, it turned out that we had failed to use proper margins, that on some pages the column graphs had been filled with various different inks, and so on. After seeing this, the usual [ocherednoy] commission from the industry's standardization laboratory pronounced the specifications to be illegal and severely reprimanded the initiators of the specifications.

We believed that if there were any errors the specialists would quickly help us with correcting them and with the preparation of the specifications in the proper format. But that is not what happened! We were informed that this was a job for better qualified people, and the development of the specifications was undertaken by several scientific research institutes, including the Ural Scientific Research Institute of Ferrous Metals and the Chelyabinsk Scientific Research Institute for Metallurgy, whose standarization laboratory sharply

criticized our specifications and in fact rejected them. Well, let it be so, we agreed, hoping to quickly obtain the specifications and to legally increase the production of the new ferroalloy.

Well, the labor of the scientific echelon is in its third year, and we still do not have the specifications. What can the plant's collective do in this situation? Should we continue to wait? But we have been producing this ferroalloy since 1981. Should we stop producing it? But the customers keep clamoring for it. And we have decided to continue producing it on the basis of temporary second-category specifications, which permit us to deal with only one customer.

But now we have seven customers. And yes, we have applications from twelve more enterprises, including Uralmash, KamAZ, and BelAZ. At the present we are producing it at the rate of 1,500 tons a year. The plant is capable of doubling or tripling its production. We have conclusions of the specialists that summarize the opinions of user enterprises that 1000 tyons of this ferroalloy save about 600 thousand roubles in the national economy. But the legalized specifications are still absent, and therefore the production of the ferroalloy can not be increased. No matter what we do, we we violate the requirements of Gosstandart [as transliterated]. We shall be punished again for something or other!

Well, all right, perhaps we are guilty of not having been able to prepare the documents in the proper form. But why punish the national economy? For if we adhere to the position of the industry's institutes, we must stop the production of ferrosilicovanadium, and the state will experience a considerable shortfall in machine production.

12973

UDC 620.178.3:620.178.16:621.9.048.7

Influence of Laser Surfacing on Fatigue and Wear Resistance of Type 45 Steel

18420204g Moscow METALLOVEDENIYE I TERMICHESKAYA OBRABOTKA METALLOV in Russian No 1, Jan 88 pp 55-58

[Article by V. Ye. Arkhipov, Ye. M. Birger and A. N. Polyakov, State Scientific Research Institute of Machine Science, Remdetal All-Union Scientific-Production Association]

[Abstract] This article studies the fatigue and wear resistance and contact strength of type 45 steel following laser beam surfacing with nickel and iron powder materials which produces coatings with controlled structure at relatively low energy cost. Surfacing was performed with an 800 W continuous CO_2 laser with an applied powder layer 0.3-0.8 mm thick. Contact strength was tested on a friction machine under loads close to normal usage loads in such applications as camshafts and fuel pumps. Wear resistance was tested under dry friction conditions with a load of 330 N/mm^2. The wear resistance of both nickel and iron-based coatings was found to be 2.5-5 times greater than that of type 45 steel. The fatigue resistance was practically unchanged by the coating process, and contact strength of the layers was found to be equal to that of type 45 steel over a broad range of loads. References 5: all Russian.

6508

UDC 621.762.8

Heat and Corrosion Resistance of Powder Steels Subjected to Chemical and Heat Treatment

18420204c Moscow METALLOVEDENIYE I TERMICHESKAYA OBRABOTKA METALLOV in Russian No 1, Jan 88 pp 44-47

[Article by L. G. Voroshnin, L. I. Frayman, L. N. Dyachkova and Ye. V. Zvonarev, Belorussian Polytechnical Institute; Belorussian Repulic Powder Metallurgy Scientific-Production Association]

[Abstract] This article studies the heat and corrosion resistance of powdered chrome steel containing 12% Cr and various additives as made and after diffusion saturation with carbon and chromium. Specimens were produced by pressing, sintering and cold compacting. Thermal stability was tested on circular specimens heated in a lead bath at 650|SDC and cooled in running water. The heating and cooling rate during thermal cycling was 20-25 K/s. Corrosion resistance was determined gravimetrically and by measurement of polarization curves in a 1-5% H_2SO_4 solution for 100 hours. The influence of porosity (5 and 15%) on thermal stability was studied. Fracture was found to start at the outside diameter of the circular specimen where the tensile stresses were greatest, with cracks forming on pores and microscopic defects and propagating primarily toward the central aperture. Thermal stability increased with decreasing porosity. The addition of copper alloys decreased mean crack depth and increased the number of cracks per unit length of the specimen. Chemical and heat treatment reduced the thermal stability of the powder steel. Highly compact materials with less than 5% porosity, saturated with carbon and chromium, were found to be most corrosion resistant. Diffusion saturation with carbon and chromium reduced thermal stability. Combined saturation decreased the negative influence of chemical and heat treatment on thermal stability. Combined diffusion saturation with carbon and chromium significantly improved corrosion resistance by increasing the thickness of the carbide zone and decreasing surface porosity. References 8: all Russian.

6508

UDC 620.17:669.787:621.762:669.14.18.29

Influence of Oxygen on Mechanical Properties and Fracture of 40N3M Steel

18420204bMoscow METALLOVEDENIYE I TERMICHESKAYA OBRABOTKA METALLOV in Russian No 1, Jan 88 pp 39-44

[Article by T. P. Moskvina and A. P. Gulyayev, Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin]

[Abstract] A study is made of the influence of oxygen on the mechanical properties of 40N3M steel as a function of its total content in the steel. Studies were performed on steel obtained by the ordinary method and by powder metallurgy from alloyed powders atomized with water then hot extruded, porosity not over 0.5%. The content of nonmetallic inclusions increased with increasing oxygen content in the samples. As oxygen content increased, the content of iron in nonmetallic inclusions increased. Mechanical properties were determined at normal temperatures after hardening from 850 C and tempering at 580 and 200 C. Increasing oxygen content from 0.004 to 0.012% decreased strength and impact strength after both types of tempering. In the powdered steel, oxygen between 0.012 and 0.12% did not influence mechanical properties, which were uniformly lower than in the cast steel, probably as a result of the uniform content of dissolved oxygen in all cases. The flying particles are saturated through with oxygen during atomization, in spite of preliminary deoxidation of the metal before melting. Oxygen thus reduces mechanical properties with content as little as 0.01%, probably due to its presence in the solid solution. Further increases in oxygen content to 0.1% have little influence on mechanical properties, although the cold shortness threshold increases. This increase in cold shortness threshold is less in powdered steels than in steels produced normally. References 4: 3 Russian, 1 Western.

6508

UDC 621.9.048.7:669.018.24

Surface Hardening of ShKh15 Steel By a Strip Electron Beam

18420204f Moscow METALLOVEDENIYE I TERMICHESKAYA OBRABOTKA METALLOV in Russian No 1, Jan 88 pp 54-55

[Article by A. A. Shulga, G. V. Dudko and A. I. Solovev, Taganrog Electronic Engineering Institute]

[Abstract] A strip electron beam was produced using a strip-shaped tungsten cathode and used to treat 20mm wide specimens of type ShKh15 steel without surface melting. The beam had a surface energy density of 1.10^{3}-5.10^{4} W.cm^{-2}, beam movement speed 1-7 cm/s, so that the beam acted on each point on the surface for 10^{-3}-10^{-1} s. The influence of the surface treatment was studied on preliminarily annealed specimens as well as specimens hardened and tempered at 150 C, indicating that a layer was formed similar in structure and distribution of microhardness to the layer formed by a circular electron or laser beam. A "white layer," a martensite-austenite mixture without visible carbide inclusions, and a microhardness of H 950-1100 is formed near the surface of the hardened specimens. Beneath the white layer is a tempered zone containing austenite sections, formed at points of accumulation of carbides, plus martensite areas. The use of the strip electron beam can significantly reduce surface treatment nonuniformity in comparison to circular electron and laser beams. The method is recommended for use in industrial hardening processes. References 7: all Russian.

6508

UDC 621.78:535.211:621.436

Laser Hardening of A Diesel Engine Valve

18420204e Moscow METALLOVEDENIYE I TERMICHESKAYA OBRABOTKA METALLOV in Russian No 1, Jan 88 pp 51-53

[Article by A. P. Androsov, S. I. Aleksenko, M. V. Boyarkin, V. G. Kusidis and V. I. Petrov, Altay Polytechnical Institute; Barnaul Transport Machine Building Plant]

[Abstract] This article presents results from combined studies of the influence of laser treatment on the structure and properties of type 40Kh10S2M steel and motor testing of diesel engine valves hardened by the technology developed. A 1 kW continuous CO_2 laser was used to harden the metal, which was not coated. Cylindrical specimens were preliminarily heat treated by hardening from 1010-1030 C in oil and tempering at 760-780 C, which yielded HRC 28-33 hardness. Metallographic studies were performed with a microscope after etching in 4% HNO_3 in alcohol. Microhardness and residual austenite content were also determined. Two zones were found in the specimens: a surface melted zone with columnar dendritic structure fine needle martensite with up to 16% residual austenite, and a zone of thermal influence with an austenite-martensite transition structure at the boundary with the first zone and ferrite-cementite initial structure deeper in the specimen. Laser hardening resulted in significant surface smoothing and improved wear resistance by a factor of 4-5 while decreasing the coefficient of friction by 15-30%. Motor testing of laser-hardened valves yielded preliminary positive results, decreased wear of valve stems and practically no valve face wear. References 4: all Russian.

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